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ABSTRACT

This literature review covers research and developments in community college technical education for the years 1978 to 1981. The source for the review was Resources in Education, and materials were selected for inclusion based on the following criteria: (1) the study pertains to technical education, defined to include not only engineering technology, but also health, business, agriculture, counseling, etc.; (2) the findings have national significance; (3) the methodology is judged appropriate and thorough; (4) the reports are available; and (5) the studies are representative of research in a particular area. The paper attempts to identify research trends, major research and development activities recently completed or initiated, and the status of the research projects. The subject areas included in the review are articulation, change process/dissemination, college credit for experiential learning, cooperative education, curriculum modules, declining enrollment, follow-up and evaluation studies, general education, handicapped students, principles applied in laboratories and clinics, learning processes, minority opportunities, program planning and philosophy, surveys of business and industry, and women's education. In addition, six recommendations are presented in the areas of developing an organized body of knowledge, changing teaching and administrative processes, coordinating research, and educating researchers. An extensive bibliography is included. (KL)

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REVIEW AND SYNTHESIS OF RESEARCH AND DEVELOPMENT in TECHNICAL EDUCATION IN COMMUNITY COLLEGES 1978 - 1981

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INTRODUCTION

In 1980 the National Center for Research in Vocational Education, Columbus, Ohio, published the Review and Synthesis opf Research and Development in Technical Education: 1968-78 by Charles R. Doty, Henry Tornell and William Wenzel. This paper is an up date of that publication from January 1, 1978 to January 1981. The source for this review was Resources in Education, subject index descriptors community colleges and technical education. The research and development reported pertains to technical education in the broad sense. That is, it is not confined to engineering technicians but includes health, business, agriculture, counseling, etc.

Practitioners should find this paper useful for identifying people, sources, and information applicable to operational situations. For researchers, the paper should provide an indication of research trends, major research and development activities recently completed or initiated, and an indication of the status of research.

It should be noted that one of the greatest problems today is synthesizing knowledge existing in an area. The day before this paper was typed the reviewer was shown a text containing annotated bibliographies of 500 studies on locus of control. During the previous week the reviewer had prepared a list of major references on longitudinal studies that was six pages in length.

The purpose in reviewing research and development is identifying those principles which have generalizability for improving the teaching-learning process. After completing the 1980 review and writing this paper the reviewer is frustrated because the research and development, with few exceptions, was not designed to produce generalizable results. Perhaps this

situation is due to the lack of interest of funding agencies, e.g., Fund for the Improvement of Post Secondary Education, to fund basic research.

The criteria used by the reviewer for the selection of studies were:

> The study pertained to technical education or is crucial information for the technical educator in a college.
>
> The findings seem to have national significance.
>
> The methodology was judged appropriate and thorough.
>
> The reports are available, e.g., microfiche, microfilm, texts, etc.
>
> The studies cited seem representative of the research in a particular area and can be used by the reader as a key to leads to research, data, people, associations, issues, and problems.

The paper contains a summary and recommendations which are then followed by a brief review of each study. The bibliography for each research and development project should enable the reader to obtain the reports for further study.

Articulation. Articulation reports are beginning to emerge concerning the secondary schools and community colleges. The Dillenbeck (1980) and Arizona State University (1979) reports of articulation, using competency based methodology, are what might be expected in the future. The economic pressures to reduce duplication of effort and to provide an educational ladder for the student will cause a tremendous increase in articulation areements in the future. For example, the state of Virginia has a project to articulate programs between secondary schools and its 42 community colleges. The state of New Jersey master plan for technical education requires all new programs to be articulated between secondary and community college levels.

Change Process/Dissemination. Change process is probably as difficult as any area to research. The model by Hull (1979) was designed upon prior research findings and has practical implications for using the model. Appel's, et al. (1978) research on individual institutional variables that aid or inhibit innovation illustrates the sophistication necessary to produce generalizable results. The basic finding was that an instructor will engage in innovation when the instructor feels the program is held in esteem by the superiors and the instructor personally has a positive attitude toward the program.

College Credit for Experience. Duffy (1977) reported the Manchester Community College, New Hampshire, project to award academic credit for business and industry inservice education. The key to awarding academic credit was a record of the teacher qualifications, subject content, and testing program.

Cooperative Education. Research in this area seems to be lacking, but program descriptions are available. The document by Arizona State Board for Junior Colleges (1979) might be representative of such descriptions.

Curriculum Modules. The development of individualized curriculum modules

seems the way of the future with eventual computerization of the modules. Modules are available concerning air pollution (Beard, et al., 1980), physics for technicians (TERC 1980), nuclear technology (Sellek, et al., General Physics Corporation, 1979), electricity/electronics (National Center for Research in Vocational Educational, 1978), solar energy (Thomas-Gordon and Spitz, 1980), and math for waste plant operators (South Dakota Dept. of Environmental Protection, 1979). In addition to these modules one might examine the National Center for Research in Vocational Educational (1980) publication of federally produced curriculum and instructional material for technical education.

Declining Enrollment. Although technical educators have generally not been affected by declining enrollment, this may happen due to demographic factors, technological change, and student wants. Collelli's (1979) study might be a starting point for reading about the problems and potential solutions to this problem. Collelli's major finding seems to be that continuous production of quality graduates is the best way to maintain industrial support for recruiting students.

Follow Up/Evaluation Studies. Persons interested in evaluation systems should examine those developed by the Office of the Chancellor, California Community Colleges (COPES and SAM). Agricultural educators have the system designed by the Department of Vocational Education, University of Illinois. Catania's report of the evaluation system for Waukesha County Technical Institute might also be examined.

Hamby's (1978) follow up of 857 Montana high school graduates from 1970-71 at the age levels of 23-25 revealed interesting results. That is, persons who entered post secondary technical education were more satisfied with their vocational education, possessed attitudes desired by employers,

and had more feelings of depression than other groups, i.e., secondary and academic/general education.

Edwards (1979) surveyed 470 graduates of engineering technology to determine math and science needed. He found the graduates wanted more math and science while employers desired the graduates to be able to solve day-to-day problems. Isbell and Jones (1976) followed engineering technology graduates at Lorain County Community College to determine their advantages and disadvantages over non-graduates; promotion was more rapid for graduates.

Stone (1975) followed 453 technical construction and manufacturing personnel to determine how industry used and trained them. Stone produced a profile of industrial expectations and faculty expectations of technicians. The profiles show a definite difference as concluded by the investigator.

The most thorough follow up study was sponsored by the Illinois Public Community College Board. There were 27,663 students involved from 47 colleges over 1974-77. The findings indicate among many results that the occupational programs in Illinois are satisfactory.

Other follow up studies are the Wallace and May (1980) study of nurses from the University of Tennessee from 1954 to 1974, Ayers' (1980) longitudinal study begun in 1973 of graduates of a technological university, and Miller and Kennedy (1979) tracking the cognitive and career development of engineers from a mid-western engineering school. Miller and Kennedy recommended a broader based education and that work study programs are needed for engineers.

Doty (1979) produced a paper titled How to Recognize Quality Technical Education programs for the American Technical Education Association Convention in 1980. Persons planning follow up studies may find the model and references useful for their planning.

To conclude, the follow up study and on site visitations by the Committee for General and Technical Education, Strasbourg, France, seems appropriate. This Committee after studying technical and vocational education in six European countries to determine fundamental traits of good programs concluded that the fundamentals might be competence of the teaching staff, structure of the school, and the basic features of society.

General/Technical Education. One of the recurrent topics noticed by the reviewer is the question of how much or what mixture of general education and technical education is best. While they do not answer this question, Morgan (1978) addresses the problems and alternative solutions for increasing communication between general and technical educators and Dziech (1979) examines the role of the humanities in vocational and technical education programs.

Handicapped Student. Persons serving handicapped students may refer to Trident Technical College's (1980) position paper that outlines recommendations to be in compliance with federal laws, Kramer and Winklers' (1980) career counseling program, Katz', et al. (1979) guide for career counseling and placement, and Jernigan's (1978) study on barriers.

Laboratory/Clinic, Principles of. Persons wanting a succinct, scholarly paper on the principles of laboratory instruction should read Ives' report (1975). One hundred advantages of laboratory/shop instruction are listed.

Learning Process. The reviewer was impressed with the research conducted in this area. Federico and Landis (1980) reported the fourth study in a series for the Navy's Electronics Preparatory Schools to determine any relations between cognitive styles, abilities, and aptitudes. They concluded that cognitive styles are relatively independent of abilities and aptitudes and may be used to predict performance and attrition. This study seems to the reviewer to be a model for research.

Gepner's (1981) formula to predict full time day freshmen college attrition during the first semester with 74% accuracy should be examined. While basically a follow up study, it has implications for the teaching/learning process.

Seeber (1981) studied the effect of spatial reasoning upon physics achievement at a community college. He found that a student needs a combination of spatial and math abilities to understand physics principles, and having math ability without spatial reasoning causes inferior performance.

Ausburn (1979) conducted a study for the U.S. Air Force concerning visuals and haptics. He concluded the visual type tends to display the cognitive style traits of field independence, reflectivity, and sharpening while the haptic tends to be field dependent, impulsive, and leveling.

While not labeled as research two sources might be examined for their usefulness for teaching. Pierson (1979) produced guidelines for a diagnostic and screening program to cope with the problems of the open door policy. Rouche (1978) wrote a module titled "Improving Student Motivation."

Minority Opportunities. Although the newspapers have continuous dialogue on minority problems only one paper was found. This was by Stark Technical Institute (1977) in which the objective was to expand minority opportunities in technical education. Persons might want to contact the Institute to learn the results of this program begun in 1976.

Planning/Philosophy. Technical educators planning the future could probably profit from the papers by Groff (1980) and Chirichiello and Crowley (1980). These reports, collectively, contain the history and philosophy of technical education and need/demand for technological personnel to 1987.

Surveys of Business and Industry. Two papers seem very useful. First is Busha's (1979) manual of techniques for conducting business and industry

surveys and second is Nelson's (1979) process for identifying new and emerging technologies. A good report in this area is the Mehallis and Fair (1979) report for Broward Community College, Florida.

Women. Three substantial studies concerning women are Alden and Seiferth (1979), DeWitt and Colasurdo (1979) and McClain (1977). These studies concentrated on the factors that influence women to return to post secondary occupational education.

RECOMMENDATIONS

After reviewing the research over a twelve year period, six recommendations appeared obvious to the reviewer. Unless some atention is given to implementing these, research findings will have limited impact.

1. Persons conducting research must design the research to assist in developing an organized body of knowledge. This means a theoretical basis must be established upon which the findings may be applied.
2. Research findings must be translated into statements of behavior or policy to change the teaching/learning process and administrative process.
3. Research should be coordinated on a state wide or regional basis to build knowledge in major areas of concern. These studies should be longitudinal.
4. Longitudinal studies within a state should have common elements for state problems and unique elements for local problems.
5. Avoid opinion research! Concentrate on scientific observation for collecting data.
6. Educate technical educators in theory and use of the numerous tests available.

REVIEWS

ARTICULATION

Dillenbeck (1980) reported the articulation process between Schoolcraft Community College, Michigan, and eleven high schools for automechanics. This document is well written and contains essential steps for articulation including task criteria for automechanics and articles of agreement.

The Division of Industrial Design and Technology, Arizona State University, coordinated the efforts of twenty-three instructors from community colleges and secondary schools to produce a listing of twenty-six major categories of tasks to be accomplished by automechanic students in industrial arts, trades, and community colleges. The results may be used to articulate instruction among three levels of education.

CHANGE PROCESS/DISSEMINATION

Hull (1979) reported a dissemination model for technical education programs conducted by Technical Education Research Center (TERC). This is the most thorough model found in the review of literature. The model tested and revised now includes: 1) tasks for the research and development stage, 2) criteria for evaluating the suitability of curriculum for dissemination, 3) national advisory committee guidelines, and 4) post developmental activities. The model, designed upon prior research, has practical explanations of how to use the model, e.g., flow charts, gnatt charts. Also included in the report are samples of the modules (Laser-Electro/Optics Curriculum Guide) used to test the dissemination model.

Appel, et al. (1978) conducted a study to determine which individual and institutional variables aid or inhibit innovations. Over 80 independent and two dependent variables were studied. In this study the subjects

were both instructors and community colleges. Eight community colleges and 80 vocational instructors plus 555 staff, other than vocational, participated. Two major objectives were specified: 1) to determine the degree of the use of individualized instruction within the eight colleges and 2) to test the viability of planned institutional change thereby challenging prior assumptions or theories of the change process in education.

To test the dependent variables, level of use and extent of use of individualized instruction, the Concerns Based Adoption Model (CBAM) and the Personalized Systematic Instruction Inventory (PSII) were utilized. The independent variables, 1) measures of innovator use, 2) perceived characteristics of the innovation, 3) perceived institutional variables, and 4) objective institutional variables, were assessed by the Background Information Form (BIF), Adult Nowicki-Strickland Internality-Externality (ANSI) Form, Stages of Concern Questionnaire, Characteristics of the Innovation Questionnaire (CIQ), the Organizational Growth Stages Questionnaire, and the Survey of Community College Organizational Functioning.

The researchers concluded the report with eleven major findings. Some of these have long range potential. The extent and level of an innovation is not dependent on the size or location of the college. Some programs of study are more adaptable for individualized instruction. Seven variables accounted for 50% of the variance in predicting the level of usage: cooperation with colleagues, sex, participation in workshops on the innovation, extent to which innovation lends itself to trial use, number of publications read, number of professional contacts, and the extent to which innovation is viewed as being easy to use.

Variables most predictive for the PSII were: cooperation with col-

leagues, perceived value of one's program by others in one's division, level of education attained, concern with learning more about the innovation, student influence on the program, years of on-the-job experience, and perceived value of one's program by the instructor.

Appel's, et al. statement seems to summarize the findings to some extent:

> It would appear that when an instructor is confident of the esteem in which his program is held by his co-workers, and when that instructor's personal evaluation of that program is also positive, the instructor experiences sufficient support to engage in an instructional innovation. (p. 60)

The reviewer was disappointed by the limited discussion of what some of the more significant variables meant. For example, sex is mentioned as a predictive variable but no information was found to answer the question, was the male or female instructor found to be innovative?

COLLEGE CREDIT FOR EXPERIENCE

An actual program designed to award college credit for inservice training (apprenticeship) in business and industry was reported by Duffy (1977). He reports practical findings concerning the implementation of the program, e.g., jurisdictional problems between community colleges arose, inservice programs in small companies were not properly documented whereby academic credit could be awarded, and criteria for awarding academic credit are given. Manchester Community College did succeed in implementing this program in several industries.

COOPERATIVE EDUCATION

The Arizona State Board of Directors for Junior Colleges produced a document (Sept. 1979) that clarifies the cooperative education programs, i.e., definitions, goals, and implementation strategies, for Arizona's Community colleges. Of particular interest are the goals for the institu-

tion, instructors, students, and employers.

CURRICULUM MODULES

Beard, et al. (1980), Associated Environment Consultants, prepared a packaged course for combustion evaluation in control of air polution. An instructor's guide, student manual, and student workbook are included. The instructional strategy is competency based with texts, handouts, slides, and individual lesson plans.

The Technical Education Research Center (Ap., 1980) produced a laboratory-based instructional system in physics for two-year technician programs that emphasizes both the analogies between basic physical principles and the applications of the principles in modern technology. The system is based on modules with the headings: force, work, rate, momentum, resistance, power, potential, force transformers, energy, transducers, vibration and waves, time constants, and radiation.

General Physics Corporation located at Columbia, Maryland produced, via several persons, i.e., Selleck B., Espy, J., Pelton, R., Groseclose, R., et al., six complete courses concerning nuclear technology in various areas, e.g., radiography, metrology, and liquids.

The National Center for Research in Vocational in cooperation with the Chief of Naval Education and Training produced a series of modules (July, 1978) in electricity/electronics. Some module titles are: current, voltage, resistance, induction, transformers, and oscillators.

Persons interested in solar energy technology might examine the Thomas-Gordon and Spitz (Jan., 1980) curriculum guide and Kuhnle's (Nov., 1977) final report on training curriculum in solar heating and cooling at the technician level. Kuhnle's report, however, is only available via the Southern Region Nuclear Energy Training Center, Texas State Technical

Institute, Waco, Texas.

The South Dakota Department of Environmental Protection produced a booklet (Oct., 1979) to aid the prospective waste water treatment plant operator or drinking water plant operator to learn to solve mathematical problems for Class I certification. The math is basic for conducting day-to-day operations.

The Office of Vocational and Adult Education (1980) published a list of federally produced curriculum and instructional materials for technical education. Other publications that may be of use to technical educators are also available from this Office in the areas of marketing, allied health, special needs groups, and business and office education.

Shepard (1980) in his dissertation on Professional Development for Water Quality Control Personnel assessed the availability and quality of inservice education. Included is a thorough review of recent literature, research and legislation, information on job training currently available, and a synthesis of the educational opportunities and quality. Data were collected from 57 agencies, 212 educational institutions, and 126 technicians from a five-state area, i.e., Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. He found the availability of inservice programs to be lacking. Wisconsin had the most structured inservice education program.

DECLINING ENROLLMENT

Covelli (1979) conducted a survey of 215 full-time faculty at Gateway Technical Institute and 100 area businesses with 50 or more employees. The purpose was to identify any effects declining or shifting enrollments have on institutional management of facilities and personnel and to develop recommendations to reduce any negative impact on these resources. While the study is not a statistically sophisticated study, it does have information

that may be of use based on a 66% return of the 215 faculty and a 78% response from industry. Some findings are that the non-traditional student is the future pool of students that must be recruited and served with flexible scheduling, particularly evening courses, and new programs. Credit for experience is mentioned. Attrition reduction, e.g., counseling, pretesting, must be increased. Efforts to increase faculty morale via inclusion of faculty in decision making, recruitment, and all efforts to retain positions prior to reduction of staff be made. Adjunct staff should be reduced or eliminated before full-time staff are reduced. Probably the finding that the best way to maintain industry support for student recruitment is to produce quality graduates. In addition, teaching the "work ethic" and "employer expectations" must be accomplished.

FOLLOW UP/EVALUATION STUDIES

The Office of the Chancellor, California Community Colleges, produced a 400 page manual on two evaluation systems for occupational programs. COPES, which is a self evaluation process that includes evaluation forms for the president, faculty, counselors, administrators, adjunct faculty, students, advisory committee members, and a site visitation team, that results in a report summarizing strengths and needed changes. SAM is a follow-up evaluation system. SAM's major components are: 1) a classification of courses, 2) student follow-up for non-continuing students by major, and 3) employer feedback. The models are presented in a humorous and professional manner that should enable the user to analyze the data to measure the performance of vocational courses.

The Department of Vocational Education, University of Illinois (1979), designed an evaluation guide to be used by community college administrators and instructors to evaluate agricultural occupational programs. The guide

contains four sections: how standards benefit students, colleges and the community, how to prepare for a review, how to conduct the review, and how to develop a plan to upgrade the program.

Catania (1980) reported the program evaluation procedure at Waukesha County Technical Institute. Three indicators considered to be vital signs of program effectiveness are: 1) student enrollment, 2) job placement, and 3) program costs. Definitions for these are given plus definitions for other factors, e.g., attrition, relevance of program content, student competence, and instructional effectiveness. Criteria for program effectiveness are discussed. For example:

> An an example, the specific criteria for improving the success Program A might be to decrease the cost by 3% while increasing the job placement by 5%; ... (p. 4)

Since this is a description of an actual program evaluation process, persons might benefit from this document.

Hamby (1978) conducted a follow-up study of 857 Montana high school graduates of classes of 1970 and 1971 who were 23-25 years old, and had been employed at least two years in Montana. The graduates were divided into three groups: post-secondary vocational, secondary vocational, and academic/general. The data analyses revealed the post-secondary group were more satisfied with their vocational training, possessed attitudes desired by employers, and had feelings of depression more than the other groups. Both vocational groups had low esteem for academic programs and attained higher incomes during the first five years following graduation than did the academic group. The academic group had high esteem for academic programs and more reliance on internal control.

Edwards (1979) at Wake Technical Institute conducted a survey of 470 graduates of six engineering programs, architectural, chemical, computer,

civil, electronic, and industrial, and 227 of their employers. The purpose was to determine the math and science needed. The survey instrument was developed by using two juror groups and tested for reliability. Eighty-one items under 17 topics and an open-ended question were included. topics included mechanics, electricity/electronics, light, sound, heat, modern physics, chemistry, biology, geology, data processing, trigonometry, logarithms, geometry, analytical geometry, calculus, and statistics.

Edwards (1979) found that mathematics topics were important to all graduates, various science topics were needed for different technology areas, e.g., electronics for electronics technicians; chemistry for chemistry for chemical technicians; and computer knowledge was important to all but architectural technicians. He also found that graduates wanted more knowledge of basic science and mathematics than employers indicated. "Employers, ..., tended to support only those topics which were immediately useful in solving day-to-day problems." (p. iv) The technicians wanted to stay up to date on technological change.

Doty (1979) produced a paper titled How to Recognize Quality Technical Education Programs. This work was the result of reviewing major studies in program evaluation. One key item not included in his model was the inclusion of the inherent characteristics and background students have prior to enrolling in technical education. This information is needed to interpret the results of technical programs.

Isbell and Jonas (1976) conducted a follow-up survey of graduates of engineering technology from Lorain County Community College, the immediate supervisors of the graduates, and the personnel officers of the companies. This was not a sophisticated study using statistics beyond the use of percentages, but the survey did yield usable information for the college. For

example, what advantages does a graduate have over a non-graduate, what skills are adequate, what skills are inadequate, e.g., mechanical design, business economics, English composition/spelling, computer logic, and statistics?

Stone (1975) at California State Polytechnic University conducted a survey of 453 technical people in construction and manufacturing representing 262 organizations. The objectives of the survey were to determine how industry uses technically trained people and what training is most appropriate for certain job requirements. To accomplish these objectives the general relationships of the research-production team were studied. A research-production team questionnaire was designed to obtain information of engineering technologist needs, production management needs, and proper man for the job needs. The latter need eventually resulted in a profile of qualities of problem solving, management, engineering, cultural/creative, human relations, and self directing. In addition a profile of industrial expectations and faculty expectations clearly show differences between the two groups. There was no statistical analysis of the data, however, which may be a shortcoming of the study. Also why the report was submitted four years after completion to ERIC is a mystery.

The Illinois Public Community College Board funded a three-year longitudinal study of Fall 1974 new students enrolled in occupational programs in Illinois' 47 colleges. There were 27,663 students involved. Results indicated that only 57% of all students enrolled in college with the intent of preparation for employment in the career area of the program. Many enrolled with short-term objectives that could be accomplished with a few courses. Sixty-three percent of the initial full-time students were still enrolled Fall 1975. The continuation rate for part-time students was

46%. Eighty-four percent who graduated were employed full or part time. Of all former students 16% were continuing their education. Eighty-two percent of the graduates reported satisfaction with their present job; 9% were dissatisfied. Of non-graduates 74% were satisfied and 15% were dissatisfied. Sixty-seven percent of all students took jobs in the community college district, 28% located in Illinois outside the school district, and 5% located outside Illinois. Former students with two or three years of community college had a median monthly salary $216 higher than persons with one year of college or less. Higher salaries were found in fire prevention and control, coal mining technology, and dental hygiene.

Wallace and May (1980) reported their follow-up of nurses who graduated from the University of Tennessee from 1954 to 1974. Among their findings were that a small number would remain employed in the traditional clinical fields, a small number remaining employed would move into specialized fields, and little evidence of career mobility into administration. Pesonal fulfillment, job satisfaction, and service to others were ranked as reasons for being employed besides the obvious one of financial need.

Miller and Kennedy (1979) tracked the cognitive and career development of engineers from a mid-western engineering school. The sample included five graduating classes from 1955 to 1975 matched with a comparative sample from a near by school of applied social science. The major instrument used was the Learning Style Inventory developed by Kolb (1976). Graduates were followed up via a questionnaire. Using a two-way ANOVA, it was found that a disparity exists between the immediate interest of the students and long-term needs. Recommendations were that a broader based education and work study program are needed. In addition, the limitations of technical education within the context of a technical career need to be

explained to and understood by engineering students.

Persons wishing to examine another longitudinal study of graduates of a technological university should examine Ayers' (1980) report. This is the seventh of a series begun in 1973.

The Committee for General and Technical education, Council for Cultural Cooperation, Strasbourg, France, conducted a study in which the primary question was, "How, and what extent, technical and vocational education can encourage occupational mobility?" (p. 2) On-site visits and surveys were made in the countries of Belgium, Switzerland, United Kingdom, Italy, Norway-Sweden, and Spain. After all information was analyzed the conclusion was that the fundamental traits of "sound" technical and vocational education had been overlooked in this study. That is, they found no evidence in their study that any of the variables studied had significant influences on student/graduate behavior. They then projected that "... a sound system meant primarily "sound teachers" ..." (p. 10) Quoting further:

> The sound values are not a list of qualifications or carefully defined contents but the competence of the teaching staff, the structure of the institution and the basic features of society. (p. 10)

GENERAL/TECHNICAL EDUCATION

Morgan (1978) in his paper defines the various problems concerning communication, or lack of, between general educators and vocational technical educators. He proposes alternatives for getting these persons to work together on developing instructional materials, writing tests, and planning 'skills fairs' in order to improve instruction.

Dziech (1979) in a paper presented at the AACJC convention explained his involvement as a humanist in restructuring a sophomore literature course to communicate with persons preparing for technician roles in

business and industry. The strength in this paper is Dziech's self analysis of himself and his peers as to their role in serving the community and society. The paper is appropriately titled The Role of the Humanities in Vocational and Technological Programs.

HANDICAPPED STUDENT

Trident Technical College (1980) produced a position paper outlining the laws concerning handicapped persons and the recommendations to meet these laws. Persons preparing similar plans for physical facilities and services would profit from this document.

Persons wishing to examine programs for career counseling might read Kramer and Winkler's (1980) description of the Trident Technical College program and Katz, et al., guide (Aug. 1979) for career counseling and job placement of disabled students at two-year colleges.

A policy focus Delphi study was conducted by Jernigan (1978) to identify the barriers which prohibit hanbdicapped students from entering or completing vocational technical programs in community colleges in Texas and to identify recommendations and tasks relating to the removal of these bvarriers. A seventy-two member group, which included a 19 member steering committee, identified 29 tasks which might be implemented or considered for policy formulation by community colleges. These 29 tasks resulted from a content analysis and distillation of the group's 351 recommendations which had evolved from 198 barriers. Fourteen of the 29 tasks correlated with 18 barriers identified by a majority (66%) of the participants as being the most severe. Ratios of desirability, feasibility, and cost-effectiveness of imnplementing the tasks were derived and verified by the steering committee.

Some of the 14 tasks identified as being related to the 18 barriers

are:

Establish inservice programs for the vocational technical and academic personnel.

Provide pre-service training and teacher preparation in colleges and universities.

Secure funding to provide for programs, services, facilities and equipment.

Provide improved and increased counseling services.

Obtain legislative support.

LABORATORY/CLINIC, PRINCIPLES OF

Ives (1975) wrote the best paper on laboratory principles read by the reviewer. Ives' initial charge was to clearly identify the objective of the engineering technology laboratory and validate the objective, determine expectations of industry, identify the engineering technology experiences as compared to current and/or traditional disciplines, and identify options for gaining practical or laboratory experience other than a university laboratory. To accomplish these objectives Ives reviewed and clearly defined the historical evolution of educational laboratory instruction in addition to defining some key principles of education. Persons wanting a succinct, scholarly paper on a model for establishing technical laboratories should definitely read this paper.

LEARNING PROCESS

Federico and Landis (April 1980) reported the fourth study in a series for the Navy's Basic Electricity/Electronics (BE/E) Preparatory Schools to determine any relationships between selected cognitive styles, e.g., deliberation vs impulse or analytical vs global orientation, cognitive abilities, e.g., understanding English language or solving specific problems, and cognitive aptitudes, e.g., recognizing factual information or visualizing objects

in space. In this study 166 graduates for whom measures of cognitive characteristics had been obtained were analyzed. The results indicated that measures of cognitive styles were significantly related to measures of abilities and aptitudes. Abilities are significantly related with aptitudes, and these measures do have a considerable amount of shared variance. Three factors, technical aptitude, verbal ability, and problem solving, account for much of the variability among the cognitive characteristics. The authors concluded that cognitive styles are relatively independent of abilities and aptitudes and may be used to predict performance and attrition. The reason for this series of studies was to maximize the computer assisted instruction being used by the Navy. Identification of instructional strategies that accommodate to student cognitive styles was the ultimate objective of this series of studies. Persons interestd in superior research should read this report.

Another outstanding research study was conducted by Ronald Gepner concerning student attrition. His dissertation Development of a Model for Identifying Potential Dropouts Among Entering Community College Students, Ed.D. dissertation, Rutgers-The State University of New Jersey, was based on a sample of 1000 students who entered Mercer County Community College in the Fall 1979 semester. Gepner divided the 1000 students into two groups for cross validation of his predictive formula. Eleven factors were tested for significance in predicting student attrition in the first semester. The formula was found to have predictive validity of 78.9% and 75.4% for the two groups.

Seeber (1981) designed a study to measure the effect of spatial reasoning, defined as spatial orientation, visualization and perception, upon physics achievement in teaching introductory physics at a community college.

His concern was based on prior findings that students with adequate math backgrounds withdrew from or failed physics. His research design included four groups to aid in isolating various causes of achievement of spatial ability. Using appropriate statistical tests to help analyze the data he tested eleven hypotheses. An important finding of the study was that a combination of spatial and math abilities are necessary for undertanding physics principles, and having math ability without spatial reasoning causes inferior performance. The research demonstrated that spatial abilities can be improved by special intervention or completion of an introductory physics course.

Ausburn (1979) conducted a study concerning two distinct types of individuals, the verbal type and haptic type. Ausburn defines the visual type as someone who reacts to his environment as a spectator and whose main sensory intermediaries are his/her eyes. The haptic person uses eyesight as primary when compelled to do so, preferring to rely on muscular, kinesthetic, and tactile input. A principal distinction between these types is that while visuals can mentally retain visual images, haptics cannot.

The subjects for Ausburn's study were 200 volunteer undergraduates at the University of Oklahoma. All subjects were administered three tests to determine type. Forty visuals and 40 haptics were clearly identified for the study. Three questions were posed. Perhaps the more significant concerned how to better teach those learners who need help. Ausburn used the technique of supplanting, i.e., instruction so designed that it performs for the learners. In this case continuous visuals (multiple imagery) were given to the haptics. The results were that although both visuals and haptics perform better with multiple than with linear imagery, haptics show greater benefit.

Ausburn (1979) conducted another study for the U.S. Air Force. In this study the purpose was to measure the effectiveness of selected tests, e.g., Hidden Figures Test and Matching Familiar Figures, to identify cognitive styles, i.e., field dependence-independence, reflectivity-impulsivity, leveling-sharpening, and visual-haptics. There were 206 volunteers involved in the study. One of the conclusions was that the visual perceptual type tends to display the cognitive style traits of field independence, reflectivity, and sharpening while the haptic tends to display field dependence, impulsivity, and leveling. Also the best predictors of perceptual type are field independence as measured by the HFT and errors on the MFF.

Pierson (1979) explains the basic concepts concerning aptitude and reading tests to be administered to technical college students for screening, diagnosing, counseling, and teaching. Reading skills for successful funcrtioning are discussed. Guidelines for examining test characteristics are discussed. Procedures for implementing a diagnostic and screening program are given. This might be considered a basic primer in how to cope with problems of the "open door" policy.

A module titled "Improving Student Motivation" by Rouche (1978) was designed to assist community college instructors in providing high risk, non-traditional students with a sense of self direction and control over their academic progress. The concepts of internal and external locus of control in relation to student expectations are explained and illustrated by case studies. Four techniques for developing internal locus of control are explained. The value of mastery learning and learning oriental instruction is described. Also the use of the Nowicki-Strickland Scales to identify externally oriented students is discussed.

MINORITY OPPORTUNITIES

Under a Title I grant of the Higher Education Act of 1965 Stark Technical College (1977) initiated a community task force for expanding minority opportunities in technical education. The task force, composed of community leaders and college representatives, became operational during the 1976-77 year. The need for this program was seen in the high unemployment situation of the area's black population. The task force met in workshop sessions focusing on the problem areas that have interfered with access to career opportunities that would be available to the black minority upon completion of associate degree programs in technical education. Specific areas of concern included financial aid, career guidance, developmental education, cooperative education, relationship of business and industry to the technical college, and the impact of technical education. Recommendations for financial aids, recruitment, community education, role models for success, and placement are outlined.

PLANNING/PHILOSOPHY

Groff (1980) made a presentation titled Planning Technical Education for the Eighties at the 1980 American Technical Education Association Conference. This is a scholarly paper that spans the history and philosophy of technical education with the presentation of a planning process to keep technical education relevant in a changing technical and social environment. It is recommended that every technical educator read this paper.

Chirichiello and Crowley (1980) developed a report for the National Science Foundation that gives national based data on need and demand for scientific and technological personnel with a detailed analysis of research and development being conducted. Personnel projections to 1987 may be of use to program administrators.

SURVEYS OF BUSINESS AND INDUSTRY

Busha (1979) produced a manual of techniques for conducting business/industry surveys and methodology for interpreting the findings. This is a very thorough guide which includes: 1) determining purposes for the survey, 2) steps in conducting the needs assessment, 3) sample selection, 4) data gathering instrument methodology, 5) training of interviewers, and 6) analysis and interpretation of data. An excellent bibliography concerning evaluation is included.

Nelson (1979) presented a process for identifying new and emerging technologies. He illustrates the basic concepts of change factors, i.e., technological change, legislation, life style changes, and resource changes. The process recommended is to gather, analyze, and interpret data, decide if a program is needed, write a job description, develop and validate a task-list, and change the curriculum.

Mehallis and Fair (1979) at Broward Community College, Florida, reported a research study to determine occupational areas in greatest need, identity job level competencies for these areas, and implement the findings. For each of the six areas examined, business data processing programmer, construction secretary, engineering drafting, electronic technician, head nurse management, and insurance secretary, the report includes minimum education required, criteria for promotion, and job tasks. The report also includes a review of the literature on occupational curricula in community colleges.

WOMEN

Alden and Seiferth (1979) administered a questionnaire to 1470 students in 16 Illinois community colleges to determine factors that influence women and minorities choice of technical careers. They found respondents did not classify occupations along race lines, with few exceptions, but

did classify many by sex. Parents were ranked as the primary influence on career choice. Others in rank order were friends/classmates, teachers, counselors, and siblings. Whites and males preferred vocational courses to a greater extent than females and non-whites.

DeWitt and Colasurde (1979) designed and tested a pre-vocational program of recruitment, instruction, advising, and placement for mature women considering careers in fields of science and technology. The purpose was to help women overcome cultural and educational constraints and develop a guide that might be used by other institutions of higher education. Highland Community College in Washington was the site of the study. Of the 54 women who enrolled in the course 90% developed a plan of action and commitment. This report is excellent because it describes in detail the instruction, tests used to determine decision making, statistical prediction results, and bibliographies, i.e., counseling, career identity and satisfaction, job searching, anxiety reduction, and work communication.

McClain (1977) examined the past, present, and future perspectives for mature women who are returning to post secondary education. Characteristics of the population, women in the labor force, myths, traditional attitudes, and discriminatory attitudes toward women, plus national and local enrollment trends are described. After this thorough description and analysis, a counseling model and career development model are proposed which the author hopes to implement. This is a thorough study which may be used as a base to begin further analysis of women work trends.

Up Date to Review and Synthesis of Research and Development in Technical Education 1968-1978 for Years 1978-1980

REFERENCES

Charles R. Doty
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Alden, E.F. and Seiferth, B.B. Factors Influencing Choice of Technical Careers by Women and Minorities. Paper presented at the Annual Meeting of the American Educational Research Association, July 27, 1979. (ED 188 656)

Appel, V.H., Roueche, J.E., and Mink, O.G. Installation and Assimilation of Educational Innovations in Vocational/Technical Programs in Post-Secondary Institutions. Final Report. Austin: University of Texas, Department of Educational Psychology, 1978. (ED 162 711)

Arizona State Board of Directors for Junior Colleges. Cooperative Education in Community Colleges of Arizona. Phoenix, Ar.: Arizona Occupational Research Coordinating Unit, September, 1979. (ED 189 417)

Arizona State University. Automotive Mechanics Articulation for Industrial Arts, Trades and Industry, and Community College Instruction. Tempe, Arizona: Division of Industrial Design and Technology, June, 1978, pp. 178. (ED 174 832)

Ausburn, F.B. Impact of Learning Styles on Air Force Technical Training: Multiple and Linear Imagery in the Presentation of a Comparative Visual Location Task to Visual and Haptic Subjects. Norman, Oklahoma: Oklahoma University, May, 1979, p. 33. (ED 174 760)

Ausburn, F.B. Impact of Learning Styles on Air Force Technical Training: Relationship Among Cognitive Style Factors and Perceptual Types. Interim Report Jan. 1977-Jan. 1978. Norman, Oklahoma: Oklahoma University, May 1979. (ED 176 761)

Ayers, J.B. Tennessee Technological University Teacher Evaluation Model - Year VII. Report 80-2. Cookeville, Tenn.: College of Education, Aug. 1980. (ED 191 833)

Beard, J.T., et al. APTI Course 427, Combustion Evaluation; Instructor's Guide. Charlottesville, Va.: Associated Environmental Consultants, February 1980. (ED 190 413, also see 190 414 thru 190 418) Available from National Technical Information Service, 5825 Port Royal Road, Springfield, VA 22161.

Busha, C.H. The Conduct of Needs Assessments Among Employers; A Manual of Techniques and Interpretations for Business/Industry Surveys. Pendleton, S.C.: Tri-County Technical College, May 1979. (ED 176 810)

California Community Colleges, Office of the Chancellor. SAM (Student Accountability Model), COPES (Community College Occupational Programs Evaluation System), & You. Sacramento, Calif.: Los Angeles Community College, 1978. (ED 177 300) (For related documents see ED 097 071 and 072 and ED 135 443)

Catania, J.C. Vital Signs of Program Effectiveness: Program Evaluation Procedure. Wankesha, Wis.: Wankesha County Technical Institute, May 1980 (ED 188 675)

Chirichiello, J. and Crowley, M. National Patterns of Science and Technology Resources 1980. Washington, D.C.: National Science Foundation, March 1980. (ED 190 406)

Council for Cultural Cooperation. Some Significant Experiments in Vocational Training (Surveys Conducted in 1977). Strasbourg, France: Council for Cultural Cooperation, 1977. (ED 187 906)

Covelli, N.J. Shifts in Enrollments and Their Effects on the Institutional Management of Gateway Technical Institute. Ed.D dissertation, Nova University, 1979. (ED 188 672)

Department of Vocational and Technical Education, University of Illinois. Dissemination and Use of Materials to Facilitate Locally Directed Evaluation of Community College Agricultural Occupations Programs. Urbana, Illinois: Dept. of Vocational and Technical Education, Nov. 1979. (ED 182 473)

DeWitt, D. and Colasurdo, E. Careers for Women in Science and Technology: A Model Treatment Program: Final Report. Midway, Washington: Highline Community College, 1979. (ED 186 652)

Dillenbeck, K.J. "Articulation With Secondary Schools - - Vocational Technical Education," Paper presented at the Annual Convention of Community and Junior Colleges, San Francisco, California, April 1, 1980. (ED 187 358)

Doty, C.R. How to Recognize a Quality Technical Education Program. Paper presented at the Convention of the American Technical Association, Los Angeles, California, March 1979. (ED 176 842)

_____, Tornell, H.E., and Wenzel, W. Review and Synthesis of Research and Development in Technical Education. Columbus, Ohio: National Center for Research in Vocational Education, 1980.

Duffy, D.E. Project for Awarding College Credit for In-Service Training in Business and Industry. Manchester, Conn.: Manchester Community College, Dec. 1977. (ED 179 690)

Dziech, B. The Role of the Humanities in Vocational and Technological Programs. Paper presented at the Annual Convention of the American Association of Community and Junior Colleges, Chicago, Illinois, April 29-May 2, 1979. (ED 175 506)

Edwards, T.I. and Roberson, C.E., Jr. A Study to Determine the Basic Science and Mathematics Topics Most Needed by Engineering Technology Graduates of Wake Technical Institute in Performing Job Duties. Raleigh, N.C.: Wake Technical Institute, 1979. (ED 178 137)

Federico, P. and Landis, D.B. Relationships Among Selected Measures of Cognitive Styles, Abilities, and Aptitudes. Interim Report, Jan. 1979-June 1979. San Diego, Calif.: Navy Personnel Research and Development Center, April 1980. (ED 190 060)

Groff, W.H. Planning Technical Education for the Eighties. Paper presented at the Annual National Conference on Technical Education, March 27, 1980. (ED 188 655)

Hamby, J., et al. A Comparison Study of the Benefits of Secondary and Postsecondary Vocational Education. Northwest Regional Educational Laboratory, January 1978. (ED 156 909)

Hemps, P., et al. Dissemination and Use of Materials to Facilitate Locally Directed Evaluation of Community College Agriculture Occupations Programs. Urbana, Ill.: University of Illinois, Department of Vocational Technical Education, November 1979. (ED 182 473)

Hull, D.M. A Dissemination Model for New Technical Education Programs. Final Report. Waco, Texas: Technical Education Research Center, 1978. (ED 166 431) (4201 Lake Shore Drive, Suite 111, Waco, Texas 76710)

Illinois Public Community Colleges Statewide Occupational Follow-Up Study: Final Report of a Three Year Longitudinal Study of Fall 1974 New Students Enrolled in Occupational Programs. Springfield, Illinois: Illinois Community College Board, February 1979. (ED 169 958)

Isbell, F.T. and Jonas, S. Engineering Technologies Program Evaluation. Elyria, Ohio: Lorain County Community College, 1976. (ED 184 595)

Ives, Quay D. Laboratory Characteristics in Technical Education. Pomona: California State Polytechnic University, 1975. (ED 177 009)

Jernigan, J.S., et al. Assisting Handicapped Students in Vocational Technical Programs in Community Colleges. Identification of Barriers Tasks to be Implemented. Summary Report. College Station: Texas A & M University, College of Education, 1978. (ED 171 904)

Katz, D. et al. Career Counseling and Job Placement of Disabled Students at Two-Year Colleges: A Guide. New York, N.Y.: City University of New York, N. Y. Institute for Research and Development in Occupational Education, August 1979. (ED 187 352)

Kramer, G.L. and Winkler, S. A Career Counseling Program for a Two Year Technical College. Charleston, S.C.: Trident Technical College, 1980. (ED 186 083)

Kuknle, C.J., Jr. Development and Implementation of Training Curriculum/Program in Solar Heating and Cooling at the Technicians Level, Dec. 1, 1976-Nov. 30, 1977. Final Report. Waco, Texas: Texas State Institute, November 1977. (ED 187 514)

McClain, R.S. The Rationale and Strategy for Serving Mature Women Returning to Higher Education. A paper presented in preparation for the Comprehensive Examination for the degree of Doctorate of Education, Massachusetts: University of Massachusetts, June 3, 1977. (ED 179 146)

Magisos, J.H. Abstracts of Instructional and Research Materials in Vocational and Technical Education. Final Report. Columbus: The Ohio State University, National Center for Research in Vocational Education, 1978. (ED 159 392)

Mehallis, Mantha V. and Fair, Kerry-Lyn. Occupational Analysis: A Basis for Curriculum Development and Evaluation. Fort Lauderdale, Florida: Broward Community College, 1979. (ED184 652)

Miller, C.W. and Kennedy, W.R. The Effects of Work Experience on the Learning Style and Career Development of Technical Professionals. Paper presented at the Northeastern Educational Research Association, October 10, 1979. (ED 183 720)

Minorities in Technical Education: A Report of the Community Task Force for Expanding Minority Opportunities in Technical Education. A One Year Assessment. Canotn, Ohio: Stark Technical College, 1977. (ED 165 830)

Morgen, G.H. "Why Do I Need This #*#*# Stuff for?" or Importance of General Education in VTAE in Wisconsin. Wisconsin, May 20, 1978. (ED 176 841)

National Center for Research in Vocational Education. Military Curricula for Vocational & Technical Education. Curriculum OUtline for Basic Electricity and Electronics. Columbus, Ohio: National Center for Research in Vocational Education, July 1978. (ED 190 875, also see 190 876 thru 190 908)

Nelson, O. New and Emerging Occupations: A Process for Monitoring and Identifying the Impacts for Vocational and Technical Education. Paper presented at the Annual Conference of the American Vocational Association, Anaheim, California, Dec. 1979. (ED 179 824)

New Hampshire Technical Institute and New Hampshire Vocational-Technical Colleges. 1979 Graduates Placement Report. Concord, N.H.: N. H. State Dept. of Education, Jan. 1980. (ED 188 648)

Office of Vocational and Adult Education. Vocational Instructional Materials for Technical Education Available from Federal Agencies. Washington, D.C.: Office of Vocational and Adult Education, 1980. (ED 190 913) For related documents see ED 190 909 thru 190 916.

Pierson, Dorothy A. Aptitude and Reading Tests for Consideration in Designing a Screening and Diagnostic Test Battery. North Haven, Connecticut, May 1979. (ED 178 558)

A Report of the Governor's Conference on Technical-Vocational Education (Austin, Texas, February 15-16, 1977). Austin: Texas Advisory Council for Technical-Vocational Education, 1977. (ED 163 206)

Roueche, J.E. Improving Student Motivation. Austin, Texas: Texas University, June 1978. (ED 184 601)

Schwerin, U. The Dimensions of Technical Education. Paper presented at the Nigeria/U.S. Workshop on Technological Development in Nigeria. New York, N.Y., April 1979. (ED 188 695)

Seeber, F.P. A Study of the Effect Upon Physics Achievement of the Use of Spatial Reasoning in the Teaching of Introductory Physics. Ed.D. dissertation, New Brunswick, New Jersey: Rutgers - The State University, 1981.

Sherrell, E.G. Comparison of Reading Readiness of Vocational-Technical Student and the Success Attained in These Courses. Final Report. Springfield: Southwest Missouri State University, 1978. (ED 175 997)

Selected List of Postsecondary Education Opportunities for Minorities and Women. Washington, D.C.: U.S. Government Printing Office, 1980. (HE 19.102:P 84/979 76P1 SN 065-000-00058-D)

Selleck, B. and Espy, J. Nuclear Technology. Course 27: Metrology. Columbia, Md.: General Physics Corporation, 1979. (ED 182 568) (Also see courses 27, 28, 29, 31, and 32, and microfishe ED 182 561 to 182 613)

Shepard, C.L. Professional Development for Water Quality Personnel. Ph.D. dissertation, The Ohio State University, 1980. (ED 188 908)

S. D. State Dept. of Environmental Protection. Mathematics for Water and Wastewater Plant Operators, Water and Wastewater Training Program. Pierre, S.D.: South Dakota Dept. of Environmental Protection, Oct. 1979. (ED 190 342)

Stone, J. The Engineering Technologist as Viewed by Employers and Educators: An Analytical Survey. Pomona, Calif.: California State Polytechnic University, July 1975. (ED 177 008)

Technical Education Research Center. Unified Technical Concepts - Phase II. Expand Application to Industrial Technologies and Adult Education. Final Report. Waco, Texas: Technical Education Research Center, April 1980. (ED 190 746, also see ED 190 747 thru 190 761) Modules must be ordered from: TERC, 4201 Lake Shore Dr., Waco, TX 76710.

Thomas-Gordon, Sandy L. and Spetz, Sally H. Solar Energy Technology: A Curriculum Planning and Resource Guide. Raleigh, N.C.: Conserva Inc., Jan. 1980. (ED 186 766)

Trident Technical College. A Study on Handicapped Services. Charles-South Carolina, Jan. 1980 (ED 186 078)

Wallace, Grace S. and May, W.T. Longitudinal Career Pattern Study of Graduates of Tenessee College of Nursing, 1954 through 1974. Vol. I. Memphis, Tenn.: University of Tennessee, 1980. (ED 183 126, also see Vol. II Ed 188 522)

White, R.H., ed. Evaluation Digest. An Evaluation Report of Vocational Education and Technical Education in South Carolina for Fiscal Year 1978. Columbia: South Carolina State Advisory Council on Vocational and Technical Education, 1979. (ED 171 927)

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